ORIGINAL

BEFORE THE

Federal Communications Commission RECEIVED

WASHINGTON, D.C. 20554

JUN 2 1 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In The Matter of	)	
	)	
Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service	)	**ET Docket No. 95-18**

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To: The Commission

REPLY COMMENTS
OF THE
AMERICAN PETROLEUM INSTITUTE

The American Petroleum Institute ("API"), by its attorneys and pursuant to Section 1.415 of the Rules and Regulations of the Federal Communications Commission ("Commission" or "FCC"), hereby respectfully submits these Reply Comments in response to the Comments filed by other participants in the instant proceeding on May 5, 1995 that addressed issues raised in the Commission's Notice of Proposed Rule Making ("Notice")[1/] that looks toward dedicating spectrum in the 2.1 GHz band for new Mobile Satellite Services (MSS).

[1/] 60 Fed. Reg. 11644 (March 2, 1995). The date for filing Reply Comments in this proceeding was extended from June 6, 1995 to June 21, 1995 by Order of the Commission (May 31, 1995).

No. of Copies rec'd 0+9
List A B C D E

REPLY COMMENTS

1. API reiterates its belief that the Commission's proposal is premature. API urges the Commission to refrain from proceeding with adoption of this proposal to reallocate spectrum until the agency has concluded several previously-initiated proceedings involving allocation of other spectrum for mobile communications services, particularly the 1.6 GHz Mobile Satellite Service ("MSS") allocation, the PCS auctions, the wide area 800 MHz and 900 MHz SMR proceedings, as well as the Large LEO allocation. API urges the Commission to then closely examine the need, if any, for additional mobile communications services.

2. If the Commission ultimately determines that additional mobile communications services are needed, API believes the agency should coordinate any MSS allocation with action taken at the World Radiocommunication Conference ("WRC-95"). As numerous participants pointed out in their Comments, to do otherwise would jeopardize the need for conformity between international and domestic allocations of spectrum.[2/]

2/ See, e.g., Southwestern Bell Mobile Systems Comments at 1. Even MSS proponents believe that the Commission's proposal is premature and that any Commission action should (continued...)

3. Despite API's opposition to reallocation of the bands 2110-2145 MHz and 2165-2200 MHz for MSS, should the Commission adopt its proposal, then API strongly supports the Commission's plan for full compensation for displaced incumbents and to provide them with comparable facilities. API urges the Commission to clarify and adopt a plan comprised of a two-year voluntary negotiation period followed by a one-year involuntary negotiation period. API similarly supports the Commission's plan to reinstate dissatisfied incumbents within the first year following their relocation. However, API believes the Commission should permit incumbent licensees to retain primary status until they have operated for one year with the new facilities.

4. API strongly emphasizes the need to require MSS licensees to pay the costs of the proposed relocation. Moreover, the proposal made in Comments of the Society of Broadcast Engineers ("SBE") to require MSS licensees to post a performance bond to ensure that relocated users are in

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2/ (...continued)
be deferred pending the results of WRC-95. Constellation Communications, Inc. Comments at 2, 4; Comsat Comments at ii, 3; Loral Qualcomm Comments at ii.

fact compensated for the costs of comparable facilities should be adopted by the Commission.[3/]

5. API emphasizes that, despite the wails of poverty heard from the MSS proponents, the cost of relocating Private Operational-Fixed Microwave Services ("POFS") and other incumbents should be viewed in the light of the potential profits the MSS industry stands to generate by using this spectrum. On the one hand, the MSS industry argues that there is a vast untapped demand for its services.[4/] On the other hand, however, the MSS industry complains that it cannot afford the cost of relocating incumbents.[5/] Which one is it? These would-be entrepreneurs cannot have it both ways. If, as MSS proponents assert, the cost of relocating incumbents is too high, then API submits that the blame lies not with the Commission's plan, the PCS industry, or the incumbents; instead it lies with the lack of economic justification (e.g., insufficient consumer demand) for additional mobile communications. If, on the other hand, demand for

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3/ SBE Comments at 7.

4/ See, e.g., Motorola, Inc. Comments at i; Newcomb Communications, Inc. Comments at 4; PCSAT Comments at 3.

5/ Iridium Comments at 2; Loral Qualcomm Comments at 10; TRW, Inc. Comments at 7.

additional mobile communications is as great as MSS proponents contend, then their estimated relocation costs of $2-$3 billion would not be excessive.[6] In fact, mobile satellite companies regularly spend over $3 billion just for deployment of one Large LEO satellite.[7] For these satellite companies, the cost of relocating incumbents would surely be worth the cost of deploying one satellite if, in fact, there existed sufficient consumer demand. API submits that adequate consumer demand simply does not exist or, if it does exist to the degree the MSS proponents argue, the satellite industry is essentially trying to buy Manhattan for a handful of beads.

6. MSS is a new telecommunications technology. The Commission is therefore correct to apply the same principles here that it developed in its 2 GHz reaccomodation proceeding for use of new telecommunications technologies (ET Docket No. 92-9). In ET Docket No. 92-9, the Commission thoroughly addressed the same issues now raised by MSS proponents concerning compensation of relocated incumbents. The Commission previously concluded that

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6/ Comsat Comments at 2, 7.

7/ Washington Telecom Week, February 3, 1995, at 10.

> [I]ncumbents subject to involuntary relocation will have the entire relocation cost paid by the emerging technology service provider. They will not incur the cost of the relocation, and in fact will benefit to the degree that aging equipment using older technology may be replaced with new equipment using state-of-the-art technology.

Third Report and Order, ET Docket No. 92-9, at ¶ 16.

7. Nevertheless, the MSS proponents ask the Commission to afford MSS special treatment by entirely changing the established rules governing compensation of displaced incumbents who relocate to accommodate emerging technologies. The Commission should flatly reject these worn-out arguments.

8. In this environment, even sound engineering standards are not safe from attack by MSS proponents. In particular, API must object to Comsat's assertion that MSS downlinks can share the band 2165-2200 MHz with FS.[8/] Comsat hypothesizes that MSS downlinks can share spectrum in the band 2160-2200 MHz with FS operations without harming the quality of the existing FS operations and that relocation of FS is therefore not necessary.[9/] Comsat also concludes that Personnel Earth Stations ("PES"), which

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8/ Comsat Comments at 3, 18.

9/ Comsat Comments at 18.

are handheld terminals for MSS, can co-exist with FS operations.[10/]

9. As Motorola correctly pointed out in its Comments, sharing between MSS and FS is not feasible in the 2 GHz bands under consideration in this proceeding.[11/] API agrees with Motorola and with the Conference Preparatory Meeting ("CPM") Report's recommendation that sharing between MSS and FS is not supportable "as MSS traffic levels build up over time with market take-up."[12/] As Motorola correctly observed, the CPM Report rated the feasibility of sharing between MSS and FS as "Moderate-Poor."[13/] API also agrees with Motorola's statement that the potential coordination difficulties would be numerous and complex in light of the heavy FS occupation of these bands.[14/]

10. API also concurs with Motorola and differs with Comsat concerning the viability and use of a single Power Flux Density ("PFD") figure in lieu of an aggregate PFD

10/ Id.

11/ Motorola Comments at 15.

12/ Motorola Comments at 17; CPM Report at ¶ 1.4.6.4(a).

13/ Motorola Comments at 17; CPM Report at ¶ 1.4.6.4(c).

14/ Motorola Comments at 18.

figure. The study included in Motorola's Comments correctly cautioned that:

> [T]he specified PFD limit on a per satellite basis may not be adequate protection for terrestrial links. Indeed, if interference protection is the objective of PFD limits, it would appear that a PFD limit from the aggregate of *all* satellites in view ought to be the operational criterion.

Motorola Comments at Appendix I.

11. In order to express their doubts concerning the soundness of Comsat's study, FS representatives participated in a conference call with Comsat engineers on June 8, 1995. FS representatives then prepared and forwarded to Comsat their own analyses of the Comsat study. Attached as Appendix I is a copy of those analyses. FS representatives have concluded that Comsat's results are seriously flawed. For example, Bill Rummler of AT&T determined that:

> By any reasonable criterion for permissible interference with which I am familiar, the interference produced by this constellation is too high by 20 to 25 dB.

Appendix I.

Likewise, Rick Smith of API cautioned that:

> API is not persuaded by Comsat's study that MSS/FS sharing is feasible in the 2.1 GHz range. API believes additional studies must be performed by industry groups with access to all necessary

> software and data, including any and all assumptions to be made.

Appendix I.

12. API also opposes Comsat's request that the Commission allow 2 GHz MSS licensees to operate in any FSS bands which are allocated internationally for MSS feederlinks at WRC-95, or at future WRC meetings.[15/] In the Commission's proceeding concerning international allocations of feederlink spectrum (IC Docket No. 94-31), API and numerous other FS entities vehemently opposed proposals to permit sharing between NGSO MSS and FS in bands which are currently occupied by FSS and FS. While difficult, FS can coordinate and share with a fixed target, such as FSS, given the proper guidelines. FS cannot, however, coordinate and share with a moving target, particularly one such as MSS, which can appear anywhere at anytime and is constantly in a different portion of the sky. In light of this crucial difference between FSS and MSS, Comsat's request for MSS access to spectrum designated internationally for FSS feederlinks is a wolf in sheep's clothing to FS users who currently share spectrum with FSS.

WHEREFORE, THE PREMISES CONSIDERED, the American Petroleum Institute respectfully submits the foregoing Reply

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15/ Comsat Comments at 37.

Comments and requests the Federal Communications Commission take action in a manner consistent with the views expressed herein.

Respectfully submitted,

AMERICAN PETROLEUM INSTITUTE

By: Wayne V. Black

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Dated: June 21, 1995

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June 14, 1995

Ms. Nancy J. Thompson
COMSAT Mobile Communications
22300 COMSAT Drive
Clarksburg, MD 20871

VIA FACSIMILE

Re: FCC ET Docket No. 95-18;
Amendment of Section 2.106 of the
Commission's Rules to Allocate
Spectrum at 2 GHz for Use
by the Mobile Satellite Service

Dear Nancy:

At the invitation of COMSAT personnel, the Fixed Services (FS) users participated in a conference call with COMSAT engineers on Thursday, June 8, 1995. The purpose of that conference was to discuss a study conducted by COMSAT and included as Appendix II in COMSAT's Comments filed in the above-captioned proceeding.

The COMSAT study concluded that sharing between Mobile Satellite Services (MSS) and FS in the 2.1 GHz band would be feasible. FS users participated in last Thursday's discussion and promised then to submit information to COMSAT on June 14, 1995 outlining some of their concerns regarding COMSAT's study. Accordingly, there is included herewith documents prepared by the American Petroleum Institute (API) and the American Telephone and Telegraph Company (AT&T).

These documents indicate a significant level of doubt concerning the soundness of COMSAT's study. In fact, Bill Rummler's analysis for AT&T concludes that MSS/FS sharing is clearly not feasible in the 2.1 GHz bands.

After you have had an opportunity to review these documents, perhaps we can schedule a conference call between MSS and FS representatives to address these substantial concerns. In the meantime, should you have any questions, please feel free to contact me directly.

Cordially yours,

John Reardon

Enclosures

cc: Sam Nguyen

AMERICAN PETROLEUM INSTITUTE

Engineering Notes

DATE: June 14, 1995

FROM: Rick Smith

RE: Analysis Concerning COMSAT's Sharing Study for Mobile Satellite Service and Fixed Service Users in the 2.1 GHz range

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A. MISSING INFORMATION

There are details missing from data presented in the Comsat analyses, and discussed in the conference call, that are significant and require further explanation. For example, a fading model was mentioned in the conference call. We would like to review the model and its applications as it relates to the study, particularly in light of the fact that the impact is profound on the accumulation of analog system noise. It is not clear to us how a fading model could have actually been applied without some presumption of the relationship between RF and baseband performance, which is in fact specific-equipment dependent.

Likewise, it is not apparent to us that worst case hits were in fact included in the data presented in the spreadsheets and plots presented. COMSAT begins to develop a "worst case" on page 5 of Appendix II in its Comments in IB Docket No. 95-18. In this "worst case" scenario, the minimum discrimination angle for which calculations are given is 10 degrees. It appears that 17.5db of "off angle" discrimination has been assumed in calculating a resulting C/I of 57.6 db. It seems to us that at some point in time a direct hit is likely to occur. The 17.5db worth of antenna discrimination would then disappear, resulting in a worst case C/I of 40db. We are concerned that the simulation data does not reflect any hits in the 40's or low 50's. Please explain.

In addition, it is not clear what directional characteristics COMSAT assumed for the satellite transmitting antennas. We would like to know whether some space antenna discrimination benefit was included, since the combined EIRP of +51.4dbW mentioned on page 5 of Appendix II is about 4db less than the 10 log addition of the 80ea +36.2 dbW individual carriers. Please explain.

B. MORE STUDY IS NEEDED AND STANDARDS MUST BE DEVELOPED

We believe the level of interference from MSS into FS is not so low that we can agree with COMSAT's hasty conclusion that "sharing works unconditionally." We believe that a joint industry group, such as the T.R.14-11 Committee that developed Annex F of Bulletin 10-F for PCS coordination, is needed to properly study the feasibility of MSS/FS sharing and to develop any necessary interference and coordination standards.

Although the ITU and CCITT have established some minimum performance objectives for terrestrial microwave radio, and some of these standards have been incorporated into the FCC's Part 25 satellite rules, the issue of satellite interference into FS needs careful review. The higher power flux density levels necessary for direct communication with subscriber units, coupled with the potential for direct hits related to non-geosynchronous operation has changed the interference paradigm. The notion that problems have been nonexistent, or manageable, under the current Part 25 rules may be insignificant because limits were generally not pushed by geosynchronous satellites.

Guidelines are necessary to establish what is an acceptable amount of frequency protection, and to establish a calibration point for establishing responsibility in cases where buyouts become necessary.

C. FS INTO MSS INTERFERENCE POTENTIAL NEEDS TO BE DISCLOSED CONCURRENT WITH ADVANCING THE IDEA OF MSS INTO FS INTERFERENCE

While we are confident Comsat has spent many long hours devising schemes to reduce the effect of FS interference into MSS subscriber units, interference problems for MSS subscribers are inevitable. COMSAT has explained that the marketing impact of interference problems in urban areas is minimal. Many other, less expensive ways exist to make telephone calls, such as cellular, SMR, etc. These are the facilities most people would be using as a first choice over MSS. Nevertheless, MSS is purported to be a "world-wide" service. The average consumer may find it difficult to understand why it doesn't work in places like Los Angeles, California. A deliberate effort must be made to manage expectations should a decision be made to go ahead with MSS/FS sharing. This issue needs to be accurately disclosed for the FCC, investors, and consumers.

During our conference call, it was mentioned that subscriber units will be able to change frequency by over 1 MHz to "get out of the way" of a nearby FS system. It is important to keep in mind that in other countries, such as Canada, FS systems in the 2.1 GHz range may be licensed for bandwidths much greater than 800, 1600, or 3500 kHz.

D. SUMMARY

API is not persuaded by COMSAT's study that MSS/FS sharing is feasible in the 2.1 GHz range. API believes additional studies must be performed by industry groups with access to all necessary software and data, including any and all assumptions to made. API is also concerned that real problems exist for FS-into-MSS interference, and hopes that this issue can be addressed concurrently. API is concerned that consumers and the FCC not be misled about the level of interference from FS into MSS facilities. These issues must be fully disclosed before investment decisions are made and expensive MSS space segments are launched and placed in operation.

AT&T

AT&T Bell Laboratories

subject: **Some results on I-CO MSS downlink interference at 2170 MHz**

date: **June 14, 1995**

from: **W. D. Rummler**
Org. 1F5C31000
HO 2E508
x7913

Engineer's Notes

To assist in the evaluation of an analysis recently provided by COMSAT to an Ad-Hoc microwave users group, I dusted off some of my software packages and made a few comparison runs. Some of the results, which are not in agreement with the COMSAT conclusions, are discussed in the following paragraphs.

Exhibit 1 shows the locus of the sub-satellite points of one of the satellites in the constellation under study. (The software was provided by Alex Latker of the FCC.) The plot shows the track of a satellite for 1 day. Since this simulation was run for 5 days, the constellation is clearly sub-synchronous. That is, the pattern repeats every 24 hours, and each of the tracks is really an over-plot of five tracks.

While sub-synchronous operation is probably not crucial to the MSS, its effects on sharing with the fixed service are particularly severe. The tracks of adjacent satellites in the constellation are separated by 9 or 18 degrees, depending on how the orbits are phased (information was not provided). As a consequence, some receivers would see a significantly more severe interference environment than others. Furthermore, a receiver that experiences a main-beam interference exposure at a time on one day will experience the same hit at the same time every day.

In simulating the interference from the I-CO constellation, I have assumed that sub-synchronous operation has been avoided by changing the altitude of the constellation slightly. Such a change would facilitate sharing.

In order to run my existing simulation, it was necessary to make some simplifying assumptions. The multiple beam pattern on page 18(?) of the COMSAT presentation shows cheek-to-cheek spot beams out to approximately 24 degrees from the sub-satellite direction. Since the limb of the earth as seen from an altitude of 10355 km appears at about 22.5 degrees, I assumed that the EIRP of the satellite was constant at 36.2 dBW per 25 kHz out to this angle. (The information provided by COMSAT variously cited this level as 36.2 and 38.2 dBW.) Since the simulation that I use needs a power flux density profile at the surface of the Earth, I had to develop a profile that would closely match that produced by a uniform EIRP at the satellite. A pfd of -102.6 dBW/m^2/MHz for angles up to 2 degrees of elevation, and -99.1 dBW/m^2/MHz for angles of 67 degrees or greater, with linear escalation between these angles, falls within 0.28 dB of the PFD profile that would be produced by the constant EIRP.

The simulation program that I used does not have an FCC Type B receiving antenna for the fixed receiver. Instead it has an ITU-R standard model of a receiving antenna developed for sharing studies (see Recommendation F.699-2). This antenna is not significantly different from the one used in the COMSAT study.

The results of a simulation run for interference into digital receivers is shown in Exhibits 2 and 3. The simulated receivers at 40 degrees north latitude operated with 4 foot antennas and had 2 dB of waveguide feeder loss and a 4 dB noise figure.

Exhibit 2 tabulates the effect of interference on the operation of receivers with different pointing azimuth angles measured from north. It provides the time-averaged interference level, the loss of fade margin implied by this mean interference level, and the associated outage increase percentage (sometimes called the fractional degradation in performance). The percentage outage increase was developed for more modest interference levels than those seen in this simulation and the tabulated numbers may significantly underestimate the effects of the simulated system. In any event, the fade margin degradations indicated here suggest that this constellation would increase the periods of unacceptable performance of a terrestrial radio route by orders of magnitude.

Exhibit 3 shows the cumulative distribution of received interference for 9 selected antenna pointing azimuths. Notice that the interference is at least 5 dB above the thermal noise in the receiver for all azimuths at all times. It is 30 db or more above thermal noise for about 1 percent of the time for azimuth angles of 50 degrees or greater. This worst case exposure interference value can be directly calculated by hand. In view of its relatively frequent occurrence, it is not clear why it did not show up in the COMSAT simulation.

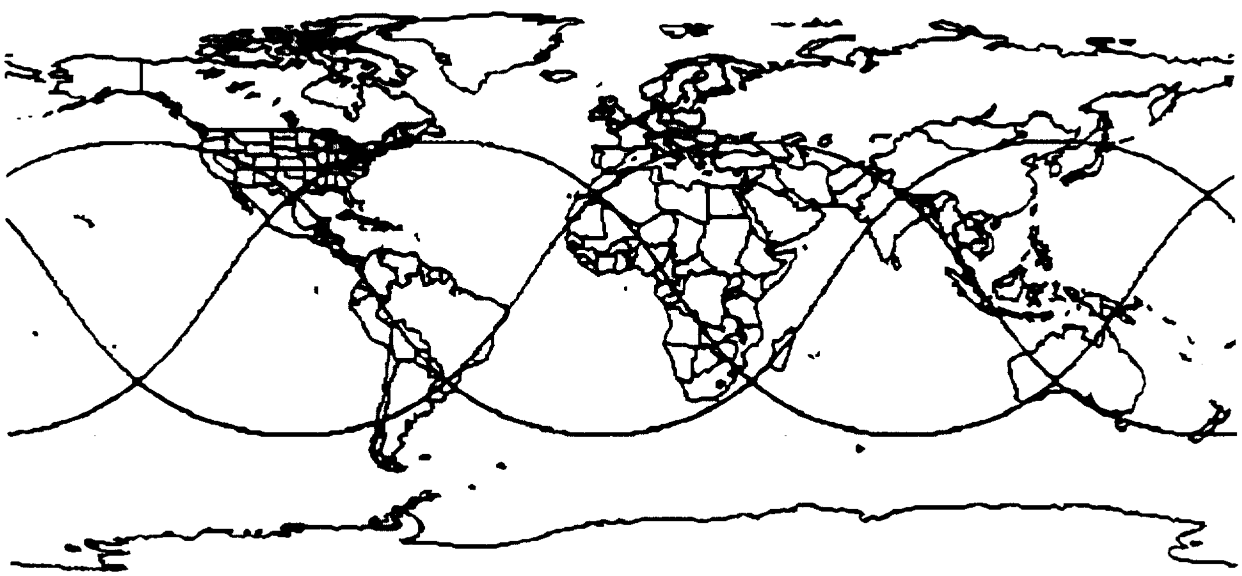
By any reasonable criterion for permissible interference with which I am familiar, the interference produced by this constellation is too high by 20 to 25 dB.

HO-1F5C31000-WDR-wdr

W. D. Rummler

Copy to
J. D. Moore

Exhibit 1



ORBITS/DAY = 4.007672 , PERIOD= 21558.65 SEC
ORBIT NO. 20 OF 20 PROGRAM COMPLETED, PRESS 'E' TO END

Exhibit 2

PERCENT INCREASE IN OUTAGE TIME FOR SELECTED AZIMUTHS

Sat. Inc. 45.0 Deg., Sat. Alt. 10355.0 km, Sta. Lat. 40.0 Deg.
10 Satellites in 2 planes, Na= 720 No= 720 Event: 304.2 Secs/year
Gmax(Rec. 699-2)= 27.0 dB Diam= 1.28 m f= 2.170 GHz NF= 4.0 dB WGL= 2.0 dB
PFD(per MHz): -102.6 dBW to 2 deg; -99.1 dBW for 67 deg elevation or more
Orb sep 90.0 deg Orb phase .0 deg

AZIMUTH ANGLE DEGREES	OUTAGE INCREASE PERCENT	MEAN INTERFERENCE ABOVE THERMAL NOISE	FADE MARGIN LOSS IN dB
0.	1182.727	10.73	11.081
5.	1183.073	10.73	11.083
10.	1186.173	10.74	11.093
15.	1195.021	10.77	11.123
20.	1213.568	10.84	11.185
25.	1248.188	10.96	11.298
30.	1311.157	11.18	11.496
35.	1431.204	11.56	11.850
40.	1697.888	12.30	12.548
45.	2531.969	14.03	14.203
50.	6088.029	17.84	17.916
55.	7657.937	18.84	18.897
60.	6447.246	18.09	18.161
65.	5677.478	17.54	17.617
70.	5147.547	17.12	17.200
75.	4771.323	16.79	16.876
80.	4484.890	16.52	16.613
85.	4278.251	16.31	16.413
90.	4110.905	16.14	16.244
95.	3988.532	16.01	16.116
100.	3895.161	15.91	16.015
105.	3828.315	15.83	15.942
110.	3792.237	15.79	15.902
115.	3776.237	15.77	15.884
120.	3775.730	15.77	15.884
125.	3796.701	15.79	15.907
130.	3822.989	15.82	15.936
135.	3860.721	15.87	15.978
140.	3913.041	15.93	16.035
145.	3970.043	15.99	16.096
150.	4017.406	16.04	16.146
155.	4077.983	16.10	16.210
160.	4142.904	16.17	16.277
165.	4192.258	16.22	16.327
170.	4229.371	16.26	16.364
175.	4262.217	16.30	16.397
180.	4287.224	16.32	16.422
Average	3659.407	15.63	15.751

Exhibit 3

CUMULATIVE PROBABILITY FOR RECEIVED INTERFERENCE POWER AT TERRESTRIAL STATION
Sat. Inc. 45.0 Deg., Sat. Alt. 10355.0 km, Sta. Lat. 40.0 Deg.
10 Satellites in 2 planes, Na= 720 No= 720 Event: 304.2 Secs/year
Gmax(Rec. 699-2)= 27.0 dB Diam= 1.28 m f= 2.170 GHz NF= 4.0 dB WGL= 2.0 dB
PFD(per MHz): -102.6 dBW to 2 deg; -99.1 dBW for 67 deg elevation or more
Orb sep 90.0 deg Orb phase .0 deg

dB Ref Noise	Azimuth of Terrestrial Station 10	30	50	70	90	110	130	150	170	dBW/MHz
-20	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-160.
-19	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-159.
-18	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-158.
-17	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-157.
-16	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-156.
-15	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-155.
-14	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-154.
-13	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-153.
-12	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-152.
-11	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-151.
-10	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-150.
-9	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-149.
-8	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-148.
-7	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-147.
-6	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-146.
-5	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-145.
-4	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-144.
-3	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-143.
-2	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-142.
-1	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-141.
0	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-140.
1	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-139.
2	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-138.
3	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-137.
4	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-136.
5	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	.10E+01	-135.
6	.98E+00	.98E+00	.98E+00	.98E+00	.98E+00	.99E+00	.99E+00	.99E+00	.98E+00	-134.
7	.94E+00	.94E+00	.94E+00	.95E+00	.96E+00	.97E+00	.97E+00	.96E+00	.95E+00	-133.
8	.91E+00	.91E+00	.92E+00	.92E+00	.93E+00	.94E+00	.94E+00	.93E+00	.92E+00	-132.
9	.75E+00	.78E+00	.80E+00	.83E+00	.85E+00	.83E+00	.83E+00	.86E+00	.87E+00	-131.
10	.56E+00	.62E+00	.67E+00	.70E+00	.72E+00	.68E+00	.69E+00	.72E+00	.76E+00	-130.
11	.47E+00	.53E+00	.59E+00	.63E+00	.65E+00	.63E+00	.65E+00	.66E+00	.67E+00	-129.
12	.27E+00	.35E+00	.43E+00	.49E+00	.50E+00	.51E+00	.50E+00	.48E+00	.46E+00	-128.
13	.00E+00	.93E-01	.25E+00	.34E+00	.30E+00	.30E+00	.26E+00	.27E+00	.28E+00	-127.
14	.00E+00	.29E-01	.20E+00	.28E+00	.24E+00	.20E+00	.19E+00	.19E+00	.20E+00	-126.
15	.00E+00	.48E-02	.16E+00	.24E+00	.19E+00	.14E+00	.14E+00	.15E+00	.15E+00	-125.
16	.00E+00	.46E-03	.13E+00	.20E+00	.15E+00	.11E+00	.11E+00	.11E+00	.12E+00	-124.
17	.00E+00	.00E+00	.11E+00	.15E+00	.11E+00	.87E-01	.87E-01	.91E-01	.97E-01	-123.
18	.00E+00	.00E+00	.96E-01	.11E+00	.83E-01	.70E-01	.70E-01	.74E-01	.79E-01	-122.
19	.00E+00	.00E+00	.82E-01	.86E-01	.65E-01	.56E-01	.56E-01	.60E-01	.64E-01	-121.
20	.00E+00	.00E+00	.70E-01	.68E-01	.52E-01	.45E-01	.46E-01	.49E-01	.53E-01	-120.
21	.00E+00	.00E+00	.59E-01	.55E-01	.42E-01	.37E-01	.38E-01	.41E-01	.44E-01	-119.
22	.00E+00	.00E+00	.50E-01	.45E-01	.34E-01	.30E-01	.31E-01	.34E-01	.36E-01	-118.
23	.00E+00	.00E+00	.43E-01	.37E-01	.28E-01	.25E-01	.26E-01	.28E-01	.30E-01	-117.
24	.00E+00	.00E+00	.34E-01	.29E-01	.21E-01	.18E-01	.19E-01	.20E-01	.22E-01	-116.
25	.00E+00	.00E+00	.28E-01	.23E-01	.15E-01	.14E-01	.14E-01	.15E-01	.17E-01	-115.
26	.00E+00	.00E+00	.26E-01	.19E-01	.13E-01	.12E-01	.12E-01	.14E-01	.15E-01	-114.
27	.00E+00	.00E+00	.23E-01	.17E-01	.12E-01	.11E-01	.11E-01	.12E-01	.13E-01	-113.
28	.00E+00	.00E+00	.21E-01	.15E-01	.10E-01	.92E-02	.94E-02	.10E-01	.11E-01	-112.
29	.00E+00	.00E+00	.19E-01	.12E-01	.84E-02	.78E-02	.80E-02	.88E-02	.97E-02	-111.
30	.00E+00	.00E+00	.16E-01	.98E-02	.68E-02	.62E-02	.65E-02	.71E-02	.78E-02	-110.